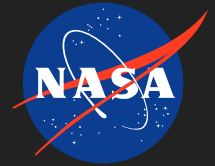


Carbon Absolute Electrical Substitution Radiometers (CAESR)

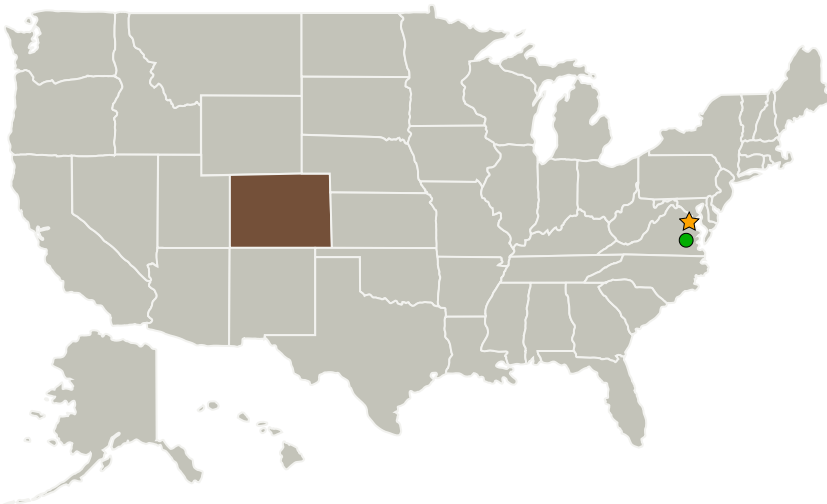
Completed Technology Project (2015 - 2018)



Project Introduction

The long-term balance between Earth's absorption of solar radiative energy and emission of radiation to space is a fundamental climate measurement required in the NRC's Decadal Survey report Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond. We apply new NIST micromachining fabrication and carbon nanotube capabilities to miniaturize ambient-temperature radiometer designs for measurements of Earth's radiation budget. With the capabilities of these new techniques and materials, we will evaluate new radiometer designs to acquire measurements of incoming and outgoing Earth radiation from small spacecraft. Miniature ambient-temperature radiometers will be designed, fabricated, and demonstrated over the broad range of requirements encompassed by Earth-incident total and spectral solar irradiance measurements, as these span the performance requirements of Earth radiation measurements for climate studies. CAESR test radiometers will be validated using international reference facilities and compared to the performance of current flight radiometers. The CAESR carbon nanotube coatings and micromachining techniques are expected to reduce instrument mass and size and decrease power needs, enabling the acquisition of such measurements from small spacecraft platforms. Integrated fabrication techniques should also greatly improve manufacturing efficiencies and yield from current flight radiometers to reduce instrument delivery times (and thus costs). The CAESR TRL entry is 2 and exit is 4, readying these compact radiometers for instrument developments on small spacecraft by the end of the 3-year program commencing in Jan. 2015.

Primary U.S. Work Locations and Key Partners



ALHAT - ETD Autonomous
Landing & Hazard Avoidance
Tech Earth Science Technology
Office

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Carbon Absolute Electrical Substitution Radiometers (CAESR)

Completed Technology Project (2015 - 2018)



Organizations Performing Work	Role	Type	Location
★ NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
University of Colorado Boulder Laboratory for Atmospheric and Space Physics(LASP)	Supporting Organization	Academia	Boulder, Colorado

Primary U.S. Work Locations

Colorado

Images

**91-1373479894122.png**

ALHAT - ETD Autonomous Landing
& Hazard Avoidance Tech Earth
Science Technology Office
(<https://techport.nasa.gov/image/5107>)

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

NASA Headquarters (HQ)

Responsible Program:

Advanced Component Technology Program

Project Management

Program Director:

Pamela S Millar

Program Manager:

Amber E Emory

Principal Investigator:

Greg Kopp

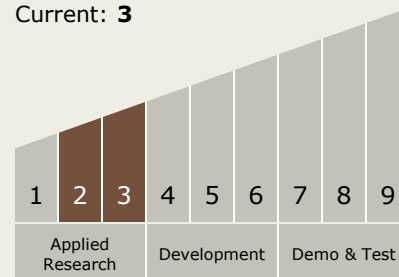
Co-Investigator:

Karen J Springfield



Technology Maturity (TRL)

Start: 2
Current: 3



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destination

Earth